

## Science Bowl Questions 1994

### Round 7

#### **Toss-Up**

1. ERSC; Multiple Choice: Of the rock types listed, which one would be the best probable source for an aquifer?
  - a) granite
  - b) schist
  - c) limestone
  - d) marble

ANSWER: C – LIMESTONE

#### **Bonus**

1. ERSC; Multiple Choice: Of the following dinosaurs featured in the movie “Jurassic Park,” which two did NOT live during the Jurassic Period?
  - a) Stegosaurus
  - b) Tyrannosaurus
  - c) Triceratops
  - d) Brontosaurus

ANSWER: B – AND C – TYRANNOSAURUS AND TRICERATOPS

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#### **Toss-Up**

2. CHEM; Short Answer: The hydrolysis of a fat, using a solution of a strong hydroxide, is called:

ANSWER: SAPONIFICATION

#### **Bonus**

2. CHEM; Short Answer: When an aldehyde is heated with Fehling’s solution, what process does it undergo?

ANSWER: OXIDATION

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### **Toss-Up**

3. COMP; Multiple Choice: Which of the following programming languages does NOT allow recursive procedure calls?
- a) FORTRAN-77
  - b) Prolog
  - c) C Language
  - d) LISP

ANSWER: A – FORTRAN-77

### **Bonus**

3. COMP; Short Answer: What are the two primary operations on a stack?

ANSWER: PUSH AND POP

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### **Toss-Up**

4. BIOL; Multiple Choice: The HIV virus is a type of:
- a) Arbovirus
  - b) Adenovirus
  - c) Retrovirus
  - d) Reovirus

ANSWER: C - RETROVIRUS

### **Bonus**

4. BIOL; Multiple Choice: The hematologic hallmark of AIDS (Autoimmune Disease Syndrome) is a reduction in CD4 \_\_\_\_
- a) B Lymphocytes
  - b) T Lymphocytes
  - c) Monocytes
  - d) Plasma Cells

ANSWER: B – T LYMPHOCYTES

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### **Toss-Up**

5. PHYS; Multiple Choice: Glider A, traveling at 10 meters (m/s) on an air track, collides elastically with glider B, traveling at 8 meters (m/s) in the same direction. The gliders are of equal mass. The final speed of glider B is:
- a) 8.4 m/s
  - b) 10 m/s
  - c) 4 m/s
  - d) 12 m/s

ANSWER: B – 10 M/S

### **Bonus**

5. PHYS; Multiple Choice: Water boils at 100 degrees C and freezes at 0 degrees C at sea level atmospheric pressure. At higher pressure, water will boil at a:
- a) lower temperature and ice will melt at a lower temperature
  - b) lower temperature and ice will melt at a higher temperature
  - c) higher temperature and ice will melt at a higher temperature
  - d) higher temperature and ice will melt at a lower temperature

ANSWER: D – HIGHER TEMPERATURE AND ICE WILL MELT AT A LOWER TEMPERATURE

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### **Toss-Up**

6. GENR; Multiple Choice: Which of the following is NOT an existing type of nuclear reactor?
- a) High-temperature gas cooled reactor
  - b) Low-temperature gas cooled reactor
  - c) Light water reactor
  - d) Pressurized water reactor

ANSWER: B – LOW-TEMPERATURE GAS COOLED REACTOR

### **Bonus**

6. GENR; Short Answer: Which type are most commercial reactors in the U.S.?

ANSWER: LIGHT WATER REACTOR

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### **Toss-Up**

7. CHEM; Short Answer: In a flame test, both lithium and strontium produce various shades of what color?

ANSWER: RED

### **Bonus**

7. CHEM; Multiple Choice: Nutrasweet, the artificial sweetener, contains molecules in which of the following group?

- a) carbohydrates
- b) lipids
- c) amino acids
- d) nucleic acids

ANSWER: C – AMINO ACIDS

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### **Toss-Up**

8. ASTR; Short Answer: What is recorded about a star by stellar astronomer using a Coude focus of a large telescope?

ANSWER: ITS LIGHT SPECTRUM (ACCEPT SPECTRUM)

### **Bonus**

8. ASTR; Short Answer: The Big Dipper is part of the constellation Ursa Major. What are such easily recognizable groupings of stars within the constellations called?

ANSWER: ASTERISMS

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### **Toss-Up**

9. BIOL; Short Answer: The restriction endonuclease NruI (n-r-u-I) cleaves DNA at the 6-base recognition sequence TCGCGA. What would be the average DNA fragment size for this enzyme if each DNA base were present equally in the DNA being cleaved?

ANSWER: 4096 BASES (OR BASE PAIRS) (ACCEPT 4 TO THE 6<sup>TH</sup> POWER)

### **Bonus**

9. BIOL; Multiple Choice: Restrictive enzymes often cleave DNA at:
- a) single-stranded regions
  - b) palindromic sequences
  - c) introns
  - d) exons

ANSWER: B – PALINDROMIC SEQUENCES

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### **Toss-Up**

10. MATH; Multiple Choice: Given 2 subsets of the United States as states east of the Mississippi River and states west of the Mississippi, the number of states in the union of these two subsets is
- a) 2
  - b) 14
  - c) 25
  - d) 50

ANSWER: D – 50

### **Bonus**

10. MATH; Multiple choice: Of these two subsets, Minnesota and Louisiana would fall into
- a) intersection
  - b) complement
  - c) boolean
  - d) correspondence

ANSWER: A – INTERSECTION

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### **Toss-Up**

11. PHYS; Multiple Choice: A moving particle is stopped by a single, head-on collision with a second, stationary particle, if the moving particle undergoes:

- a) an elastic collision with a second particle of much smaller mass
- b) an elastic collision with a second particle of much greater mass
- c) an elastic collision with a second particle of equal mass
- d) any type of collision in which the coefficient of restitution is zero

ANSWER: C – AN ELASTIC COLLISION WITH A SECOND PARTICLE OF EQUAL MASS

### **Bonus**

11. PHYS; Multiple Choice: If a magnifying glass is held under water, its magnifying power is

- a) decreased
- b) the same as it was out of water
- c) increased
- d) none of the above

ANSWER: A - DECREASED

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### **Toss-Up**

12. CHEM; Short Answer: Which scientist first stated the law of conservation of mass?

ANSWER: LAVOISER (PRON: LAV-WAZ'-E-A)

### **Bonus**

12. CHEM; Shot Answer: Who developed the wave equation that is used to determine the PROBABILITY of finding the electron in any given place?

ANSWER: SCHRODINGER

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### **Toss-Up**

13. COMP; Short Answer: If A is a set, what is the set of all subsets of A called?

ANSWER: POWERSET OF A

### **Bonus**

13. COMP; Short Answer: Recursion is usually simulated in a nonrecursive programming language by means of what data structure?

ANSWER: STACK

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### **Toss-Up**

14. BIOL; Multiple Choice: Which mating system would you expect to find in a mammalian species whose young require intensive, long-term parental care?

- a) polygamy
- b) lekking
- c) monogamy
- d) harem tending

ANSWER: C – MONOGAMY

### **Bonus**

14. BIOL; Multiple Choice: You have isolated four auxotrophic mutants of Salmonella (a relative of E. coli). Each contains a single mutation. Mutants 1 and 2 require only histidine for growth. Mutant 3 requires histidine and vitamin B1. Mutant 4 requires B1 only. The mutation in 2 is not complemented (in merodiploids) by any of the other mutations. Mutant 2 must be:

- a) a recombinant
- b) a deletion
- c) unstable
- d) dominant

ANSWER: D – DOMINANT

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### **Toss-Up**

15. ASTR; Short Answer: Arrange the following astronomical objects in order of increasing distance from Earth:

Saturn Moon Sirius The Pleiades Sun

ANSWER: MOON, SUN, SATURN, SIRIUS, THE PLEIADES

### **Bonus**

15. ASTR; Short Answer: Consider two Type F2 stars whose apparent magnitudes are +4 and +7, respectively. If their absolute magnitudes are each +4, how far away is the first star in parsecs?

ANSWER: 10 PARSECS

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### **Toss-Up**

16. PHYS; Multiple Choice: If a body moves in such a way that its linear momentum is constant, then:

- a) its kinetic energy is zero
- b) the sum of all forces acting on it must be zero
- c) its center of mass remains at rest
- d) the sum of all the forces acting on the body is constant and nonzero

ANSWER: B – THE SUM OF ALL THE FORCES ACTING ON IT MUST BE ZERO

### **Bonus**

16. PHYS; Multiple Choice: If you see a person through space at half the speed of light, relative to your clocks, you will also see his/her clocks running:

- a) at half their normal speed
- b) slower than half their normal speed
- c) slower, but greater than half speed
- d) backwards

ANSWER: C – SLOWER, BUT GREATER THAN HALF SPEED

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### **Toss-Up**

17. CHEM; Multiple Choice: Pure water is approximately what molar concentration:

- a) .55 Molar
- b) 5.5 Molar
- c) 55 Molar
- d) 550 Molar

ANSWER: C – 55 MOLAR

### **Bonus**

17. CHEM; Short Answer: The removal of two hydrogen atoms from a primary alcohol yields what type of chemical substance?

ANSWER: ALDEHYDE

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### **Toss-Up**

18. ERSC; Multiple Choice: The Number of years of the earth's history exposed by the cut-away of the Grand Canyon is approximately:

- a) 250 million
- b) 500 million
- c) 750 million
- d) over a billion

ANSWER: D – OVER A BILLION

### **Bonus**

18. ERSC; Short Answer: The initial process of a stream beginning to carve out a series of paths which lead to a channel is called:

ANSWER: NICK POINT SUCCESSION

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### **Toss-Up**

19. GENR; Short Answer: In 1983, Dr. Barbara McClintock received the Nobel Prize for genetic studies that led to the discovery of transposable elements. What was the organism used in her studies?

ANSWER: CORN (MAIZE)

### **Bonus**

19. GENR; Short Answer: What is the term for the capacity of a rock or material to transmit a fluid?

ANSWER: PERMEABILITY

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### **Toss-Up**

20. PHYS; Short Answer: Name the physicist who led the scientific team that produced the first self-sustaining chain reaction

ANSWER: (ENRICO) FERMI

### **Bonus**

20. PHYS; Short Answer: Fermi's team achieved the first self-sustaining chain reaction in what year?

ANSWER: 1942

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### **Toss-Up**

21. BIOL; Multiple Choice: Animals are separated into the groups of protostomes and deuterostomes based on:

- a) the fate of the blastopore
- b) the number of germ layers
- c) the presence of a coelom (pron. seal'-um)
- d) the amount of cephalization

ANSWER: A – THE FATE OF THE BLASTOPORE

### **Bonus**

21. BIOL; Multiple Choice: This type of tooth is always found in a socket and is typical of mammals.

- a) acrodont
- b) pleurodont
- c) thecodont
- d) homodont

ANSWER: C - THECODONT

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### **Toss-Up**

22. CHEM; Short Answer: Name 4 of the 5 elements of the periodic classification which comprise the Carbon Group.

ANSWER: CARBON, SILICON, GERMANIUM, TIN AND LEAD

### **Bonus**

22. CHEM; Multiple Choice: A compound which contains two ring structures having one common carbon atom is known as a:

- a) spiro-compound
- b) nonpolar compound
- c) interstitial compound
- d) inner compound

ANSWER: A – SPIRO-COMPOUND

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### **Toss-Up**

23. PHYS; Multiple Choice: In sound level measurement, what change in pressure constitutes an increase of three decibels

- a) Three added to the previous reading
- b) Twice the sound pressure
- c) Three times the sound pressure
- d) Ten times the sound pressure

ANSWER: B – TWICE THE SOUND PRESSURE

### **Bonus**

23. PHYS; Multiple Choice: A stereo amplifier requires 1.5 amperes at 120 volts to produce 100 watts of output power. What is its approximate efficiency?

- a) 25 percent
- b) 40 percent
- c) 55 percent
- d) 80 percent

ANSWER: C – 55 PERCENT

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### **Toss-Up**

24. MATH; Multiple Choice: The result of  $5!$  (five factorial) is expressed as 170 (one seven zero). In what base is the numeric notation being used?

- a) binary
- b) octal
- c) decimal
- d) hexadecimal

ANSWER: B - OCTAL

### **Bonus**

24. MATH; Multiple Choice: In decimal, what is the sum of 10x (one zero hexadecimal), 10o (one zero octal), 10d (one zero decimal) and 10b (one zero binary)?

- a) 30
- b) 32
- c) 36
- d) 64

ANSWER: C – 36

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### **Toss-Up**

25. BIOL; Multiple Choice: The precursor of the replacement bone in your ulna is:

- a) hyaline cartilage
- b) calcified cartilage
- c) elastic cartilage
- d) membrane bone

ANSWER: A – HYALINE CARTILAGE

### **Bonus**

25. BIOL; Multiple Choice: Which of the following groups probably gave rise to the tetrapods?

- a) Actinopteryhii (pron: ak-tin-o-ter-i-gi)
- b) Agnathans (pron: ag-na-thans)
- c) Holocephali (pron: ho-lo-sef-a-li)
- d) Crossopterygians (pron: cross-o-ter-i-gans)

ANSWER: D – CROSSOPTERYGIANS

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